DESIGN SPECIFICATION
FOR
EOD-LARSYS PROCEDURE 1 FOLLOW-ON

Job Order 71-695

Prepared By

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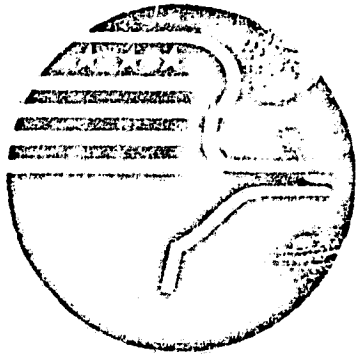
Houston, Texas

Contract NAS 9-15200

For

EARTH OBSERVATIONS DIVISION
SPACE AND LIFE SCIENCES DIRECTORATE



National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER

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1. SCOPE

This document contains a design specification for implementing two Procedure 1 follow-on features. These features are:

- On option, determine the best k of N passes in feature selection.
- On option, include a-priori weighting based on pixel population in clusters in feature selection.

These additions will be made to the SELECT processor of the EOD-LARSYS system.

EOD-LARSYS is operational on the UNIVAC 1108 EXEC II computer system located in Building 12. The system is batch oriented, and operated and maintained according to IDSD procedures.

This document assumes the reader is familiar with both Procedure 1 and the EOD-LARSYS system.

2. APPLICABLE DOCUMENTS

- Final Design Specification for EOD-LARSYS Procedure 1, Houston, Texas, August 1977, JSC-12742, LEC-10417.
- Job Order: 63-1347-1695
- Final Design Specification for Procedure 1

3. SYSTEM DESCRIPTION

3.1 HARDWARE DESCRIPTION

N/A

3.2 SOFTWARE DESCRIPTION

Two new features will be added to the SELECT processor to meet follow-on Procedure 1 requirements. The first is the selection of the best k of N passes based on the overall separability criterion, where N is the total number of passes accounted for in the CHANNELS input, and k is any number less than N. The number of channels per pass j may be specified.

The second is the modification of the inter-subclass weights by a multiplier based on the number of pixels in each subclass.

3.2.1 LINKAGES

The SELECT processor uses the FORTRAN V compiler, UNIVAC software system routines, EOD-LARSYS utility routines, and common blocks. SELECT uses common blocks INFORM, GLOBAL, FSL, and BESTKN.

3.2.2 INTERFACES

SELECT requires a statistics file (tape, FASTRAND, or card deck). Optionally input (Davidon procedure) is the B-MATRIX file or card deck. See sections 4.1 and 4.2, respectively in User Documentation EOD-LARSYS.

3.2.3 INPUTS

a. Processor card

Keyword

$SELECT

b. New/Revised Control Cards

Keyword	Parameter	Function
BSPASS	K	Number of passes in best subset of N passes.
NCPASS	J	Number of channels per pass.
APRIORI	FILE Default: No a-priori weighting applied.	Flags a-priori weighting as multiplier to usual weight (based on number of pixels in each subclass).
PROCEDURE	M Default: M=2	M=6. The best k of N passes procedure is used.

3.2.4 OUTPUTS

The B-Matrix file is written or punched if the Davidon proceudre is used (PROCEDURE 3).

3.2.5 STORAGE REQUIREMENTS

TBD

3.2.6 DESCRIPTION

The implementation of the best k of N passes option requires modifications to subprograms SELECT, and SETUP4. SETUP4 reads the two control cards necessary to invoke this option, and passes the associated parameters to SELECT through the common block BESTKN.

Routine SELECT then examines the input channels for complete subsets of passes (the number of channels per pass is four in the example that follows). An internal data table of combinations is

then used to exhaustively select all combinations of features corresponding to k of N passes.
For example, let k=2
N=4

CHANNELS = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

The first pass corresponds to channels 1 through 4, the second pass to channels 5-8, and so on.

The procedure calls for the evaluation of the separability for the following combinations of passes and printout of results:

Passes		Channels
1	2	1, 2, 3, 4, 5, 6, 7, 8
1	3	1, 2, 3, 4, 9, 10, 11, 12
1	4	1, 2, 3, 4, 13, 14, 15, 16
2	3	5, 6, 7, 8, 9, 10, 11, 12
2	4	5, 6, 7, 8, 13, 14, 15, 16
3	4	9, 10, 11, 12, 13, 14, 15, 16

The user can then visually scan the results and pick the best combination. The program will also pick this and do the setup for subsequent processor runs. The evaluation process is based on the program logic inherent in the evaluate features option (PROCEDURE 5).

The modification of inter-subclass weights involves changes to subprograms SETUP4, PRELIM, and REDDAT. REDDAT (a utility routine involved with the statistics file) passes the number of pixels per subclass (after grouping) to routine PRELIM by means of common block BESTKN. Routine PRELIM then applies the a-priori weighting to the existing inter-subclass weights by multiplying by the following factor, for subclass pair (i,j):

$$\text{FACTOR } (i,j) = \frac{N(i) * N(j)}{\left[\sum_{K-1}^{TOTSUB} N(k)\right]^2}$$

where TOTSUB is the total number of subclasses and N(i) is the number of pixels in subclass i.